J. Malac. Soc. Aust. 4(1-2): 43-47. 1 July 1978.

BROODING OF CHITONS IN TASMANIA

ELIZABETH TURNER

Tasmanian Museum and Art Gallery.

SUMMARY

The occurrence of brooding among Tasmanian chitons is reported. For *Ischnochiton (Ovatoplax) mayi* this habit is recorded for the first time. Notes of brooding by *Heterozona subviridis* and *Paricoplax crocinus* are included. Observations on *Eudoxoplax inornata* and *Callistasecla mawlei* suggest that these species may also brood.

INTRODUCTION

There has been very little research on the reproduction and development of chitons. However, it is known that there is a range from external fertilization of free eggs, through various stages of development in the parent's branchial cavity before discharge, to full development of juveniles before release and, ultimately, to viviparity (Dell, 1962 : 512-513; Smith, 1966: 433-466).

Although the occurrence of chitons brooding in Tasmania was first noticed in 1922, no further observations were made until 1971, when specimens of *Ischnochiton (Ovatoplax) mayi* were seen to have juveniles in the mantle cavity. In 1977, after the discovery of further species which either brooded or were suspected of doing so, it was decided that this aspect of chiton behaviour should be officially recorded.

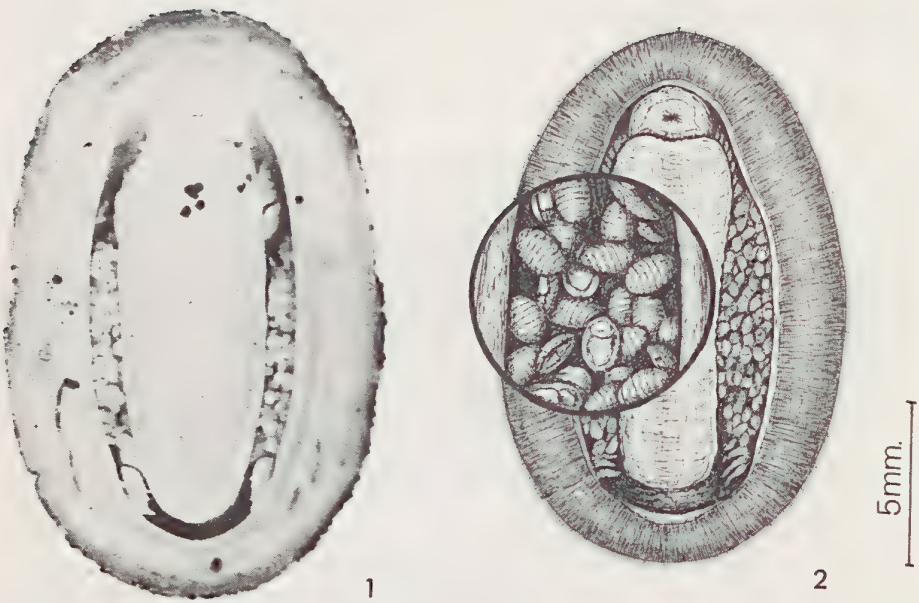
ABBREVIATIONS

A.N.S.P. ..... Academy of Natural Sciences of Philadelphia.
N.M.V. ..... National Museum of Victoria, Melbourne.
T.M. ..... Tasmanian Museum, Hobart.

OBSERVATIONS

Ischnochiton (Ovatoplax) mayi

During April 1971, Mr. J.R. Penprase, of Hobart, collected 10 specimens of *Ischnochiton (Ovatoplax) mayi* Pilsbry, 1895, at Port Arthur, on Tasman Peninsula in south-eastern Tasmania. After their donation to the Tasmanian Museum (T.M. E8352), three were found to be brooding their young inside the mantle cavity. The latter range from well-developed eggs to metamorphosed (i.e. eight-valved) juveniles. An accurate count of numbers can not be taken unless the young are removed and it was decided not to disturb them at that time. However, estimates are:– specimen A, 30-40 on the left side of the foot and 20-30 on the right; specimen B, 30-40 on the left and none on the right; specimen C, none on the left and 50-60 on the right.



FIGURES 1-2.
1. Photograph of ventral view of *Ischnochiton (Ovatoplax) mayi* brooding 8-valved juveniles.
2. Drawing of *Ischnochiton (Ovatoplax) mayi* showing a magnification of juveniles.

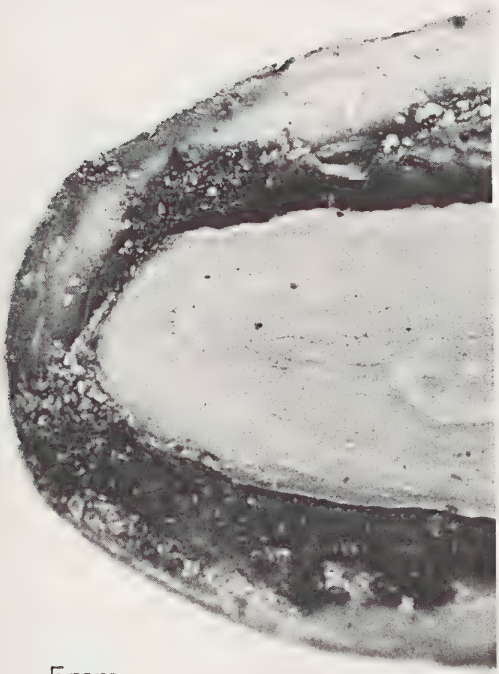
Examination of samples of *I.(O.) mayi* already in the Tasmanian Museum's collection revealed minute, metamorphosed juveniles still adhering to the dried valves of each of three specimens (T.M. E1277) which were collected in April 1957, from Point Puer, about two miles south of Port Arthur. The original positions of the young can not be ascertained, but their numbers are:– specimen D, three; specimen E, nine; specimen F, five.

Most *I.(O.) mayi* juveniles are about 0.80 mm. in length, while the parent adults range from 10-15 mm. However, three large, dry specimens (T.M. E187) from Maria Island, eastern Tasmania, collected in January 1917, by W.L. May, range in length from 13-17 mm. The remains of dried eggs are still attached inside the mantle cavity of the smallest of these three specimens.

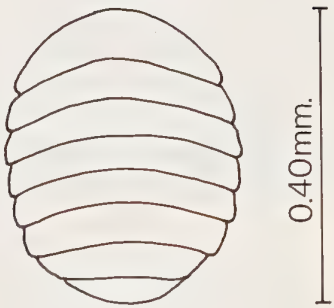
Since April 1971, another seven samples of brooding *I.(O.) mayi* have been collected from south-eastern Tasmania:– Sadgrove Point (Bruny Island), May 1974 and November 1975; Dennes Point (Bruny Island), April 1977; Taranna, March 1975; Port Arthur, May and June 1971; Clyde Island (Eaglehawk Neck), September 1971.

The species was originally described by Pilsbry (1895: 128) and was placed in genus *Ischnochiton*, sub-genus *Haploplax*. It was recorded variously as *Ischnochiton (Haploplax) mayi* Pilsbry, 1895, or as *Sypharochiton mayi* (Pilsbry, 1895) until 1939, when Cotton and Weeding (1939: 184) established *Ovatoplax* as a new sub-genus of *Ischnochiton*, to contain this single species.

A series of syntypes of *I.(O.) mayi* is lodged in the Academy of Natural Sciences of Philadelphia (A.N.S.P. no 65626). These chitons were collected at Eaglehawk Neck, south-eastern Tasmania, by W.L. May on an unknown date. Of the five dried specimens, three show no sign of brooding whereas



3



4

FIGURES 3-4.
3. Photograph of ventral view of *Heterozona subviridis* brooding 8-valved juveniles.
4. Drawing of *Heterozona subviridis* juvenile.

the fourth has fifteen young still adhering to the valves and the fifth has thirty-six. (Dr. Robert Robertson, Academy of Natural Sciences of Philadelphia, personal communication, July 28, 1971). Pilsbry did not comment on this occurrence in his original description.

The syntype held by the Tasmanian Museum (T.M. E186), is a dried specimen represented only by the valves and it shows no sign of brooding.

Ischnochiton (Ovatoplax) mayi prefers the undersides of rocks and stones, usually in sheltered bays and inlets. Localities where it has been found so far are Dover; Lunawanna, Barnes Bay, Sadgrove Point, Ford Point and Dennes Point (all on Bruny Island); Oyster Cove (D'Entrecasteaux Channel); Blackman's Bay; Spectacle Island (Frederick Henry Bay); Norfolk Bay; Taranna; Wedge Bay; Point Puer; Port Arthur; Fortescue Bay; Pirates Bay and Clyde Island (Eaglehawk Neck); Maria Island. *I.(O.) mayi* is also listed as being collected at Tamar Heads (May and Torr, 1912: 31). However, the author has not seen these examples, nor are they known to be lodged in any of the major museums of Australia, and it would be interesting to learn if they still exist. The species has not been recorded formally beyond the Tasmanian mainland. However, the Australian Museum, Sydney, has specimens collected from Clarke Island (Bass Strait) and Mallacoota (Victoria). (Dr. Winston F. Ponder, The Australian Museum, Sydney, personal communication, November 16, 1971).

Heterozona subviridis

Heterozona subviridis Iredale and May, 1916, a chiton found commonly in Tasmania, also broods its young to the eight-valved stage. Brooding was first recorded by Iredale and Hull (1923: 191), who stated: "One of us took specimens of *Heterozona subviridis* at King Island, Bass Strait, with clusters of eggs disposed along the outer margin of the foot".

Two specimens (T.M. E8357) of *H subviridis* which were collected at Port Arthur, in February 1971, have many metamorphosed juveniles in the mantle cavity. The first chiton is 37 mm. in length and has over 100 young on the left side of the foot and more than 200 on the right. The second chiton, 40 mm. in length, has over 200 on the left side, but none on the right. The juveniles are 0.40 mm. long. A specimen (T.M. E8393), 23 mm. long, collected from nearby Safety Cove in February 1971, carries eight young. Another (T.M. E8367), 25 mm. in length, taken from Tinderbox, south of Hobart, in September 1971, broods six juveniles.

Paricoplax crocinus

Another chiton, *Paricoplax crocinus* (Reeve, 1847), broods its eggs, but it is not known as yet how far they develop before dispersal. One brooding specimen (N.M.V. G30097) was collected at East Devonport, north-western Tasmania, by Mr. R.C. Robertson, in December 1971. The eggs measure 0.30 mm. in length and are partially encased in a damaged, membraneous sac. Without endangering the sac further, the number of eggs can not be ascertained, but is estimated at over 100. The brood is situated in the mantle cavity at the anterior end of the right side of the foot. The adult animal is 17 mm. long.

A dried specimen (T.M. E178) of *P crocinus*, collected at Port Arthur in January 1917, by W.L. May, still has eggs adhering to the ventral surfaces of the valves.

Eudoxoplax inornata

An example (T.M. E9012) of the large chiton *Eudoxoplax inornata* (Tenison Woods, 1881), which can grow to a length of 100 mm., has been found with 20 loose, minute eggs in the mantle cavity on the left side of the foot. The adult animal measures 42 mm. and the eggs 0.20 mm. in length. It was collected at Tinderbox, southern Tasmania, by Mr. J.R. Penprase, in September 1974. Another specimen taken from Tinderbox in February 1971, shows dried eggs adhering to the ventral surfaces of the valves. However, it is not certain that *E inornata* genuinely broods. Further specimens with eggs in the mantle cavity will need to be found to support these observations.

Callistasecla mawlei

An interesting species, but yet to be proven as a genuine brooder, is *Callistasecla mawlei* (Iredale and May, 1916). In a sample (T.M. E9675) from Port Arthur, collected in September 1976, by Mr. Penprase, metamorphosed juveniles are attached to the dorsal surfaces of the adults. Two specimens, 13 mm. and eight mm. long, which were donated to the Tasmanian Museum, each carry three young chitons. The latter have well-sculptured valves and are 0.30 mm. in length. Four adults from the same sample were retained by Mr. Penprase. There are 4-6 juveniles on the dorsal surface of each of these animals. However, 45-50 young are floating free in the alcohol in which the collection is preserved. Two half-grown chitons in the sample are not carrying any young.

CONCLUSION

It is apparent from Dell (1962: 513) and Smith (1966: 442) that few chiton species in the world are known to brood their young as far as the eight-valved stage. It is therefore significant that two such species, possibly three, should occur in Tasmania, with a further species, and probably another, brooding eggs. The author knows of no examples of brooding chitons found on the Australian mainland to date. Several brooding or viviparous echinoderms are also found in the waters of south-eastern Tasmania. The reasons for all of these cases of juvenile protection have not yet been ascertained.

ACKNOWLEDGEMENTS

The author wishes to thank Dr. Robert Robertson of the Academy of Natural Sciences of Philadelphia, Miss A. Green, Mr. A.J. Dartnall, Mr. R.C. Robertson, Mr. R. Burn, Dr. B.J. Smith and Dr. W.F. Ponder for information and advice.

A special acknowledgement is due to Mr. J.R. Penprase, who collected many of the brooding specimens and who has greatly enlarged the chiton collection in the Tasmanian Museum by his donations of material.

REFERENCES

COTTON, B.C. & B.J. WEEDING, 1939. Flindersian Loricates. *Trans. R. Soc. S. Aust.* 63(2), 1939: 184.

DELL, R.K., 1962. Stages in the Development of Viviparity in the Amphineura. *Nature* 195: 512-513.

IREDALE, T. & A.F.B. HULL, 1923. A Monograph of the Australian Loricates (Phylum Mollusca : Order Loricata). I. Systematics and Structure. *Aust. Zool.* 3(5): 186-194.

MAY, W.L. & W.G., TORR, 1912. The Polyplacophora of Tasmania. *Pap. Proc. R. Soc. Tasm.* 1912: 31.

PILSBRY, H.A., 1895. Note on Tasmanian *Acmaea* and *Ischnochiton*. *Nautilus* 8(2): 128-129.

SMITH, A.G., 1966. The Larval Development of Chitons (Amphineura). *Proc. Cal. Acad. Sci* 32(15): 433-466, 11 figs.